EOSDIS IV&V
Monthly Program Status Report
For the Period 6/16/94 to 8/1/94

Submitted

August 15, 1994

INTERMETRICS
6301 Ivy Lane
Greenbelt, MD 20770

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Program Manager

Date

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Date

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1. PROGRAMMATIC INFORMATION

1.1 IV&V Project Organization Chart

Exhibit 1-1 illustrates the current organizational structure of the EOSDIS IV&V team. For each lead position, we have identified company affiliation, geographic location, phone number, and task assignment. Also included is the number of full time equivalent engineers assigned to each technical task.

1.2 Overview of Work Being Performed

a) List of Active Task Assignments

- Task 1: IV&V Program Management
- Task 2: Documentation and Presentation of IV&V Program Status
- Task 3: IV&V Plans
- Task 4: IV&V Infrastructure and Tool Development
- Task 5: Requirements Analysis and Traceability
- Task 9: Key Interface Analysis
- Task 10: Development of EOS Ground System Certification Plan

b) Key Recent Accomplishments

- **Programmatic**

  - Built staff level to 33 people, with 25 in Greenbelt location and 8 in Fairmont location. (Note that 4 members are part-time.)

  - Generated 70 RIDs (32 involving system design issues and 38 involving interface requirements) in 3 days, after only 17 days on the contract.

  - Reassessed program cost estimates to account for budgetary constraints.

  - Reviewed existing task Statements of Work (SOWs) and compared them with new budgetary constraints. Providing inputs to revise SOWs so that they reflect changing program needs.

  - Met with HAIS to establish productive working relationship and further define roles and interfaces.

  - Met with science community advocates to discuss user satisfaction issues.

Exhibit 1-1: Org Chart (Landscape)

- Began coordinating activities with NASA/WVU to enhance IV&V processes under the collaborative environment program at the IV&V facility at Fairmont, WV.

- **Technical**

  - Under Task 3, finalizing a draft version of the IVV Master Plan, to be delivered to NASA on 8/15/94.

  - Under Task 4, produced and delivered to NASA the requirements and architecture specifications for the Milestone 1 (M1) configuration of the IV&V infrastructure and tools.

  - Under Task 5, developed a requirements database to aid in assessing the technical integrity of system requirements. This database addresses requirements traceability, quality, and testability. It includes a quantified problem severity rating by requirement, as well as an engineering rationale substantiating the assigned rating.

  - Under Task 9, began a detailed analysis of the TRMM Interface Requirements Document (IRD) and developed a detailed outline of the TRMM Technical Assessment Report (TAR).

  - Under Task 10, began developing the EOSDIS Certification Plan (ECP) and briefed our certification approach at the June 29th GSIWG.

c) New/Proposed Task Assignments

- **Key Interface Testing Task -** This proposed new task is currently incorporated as the second half of Task 9, "Key Interface Analysis and Test." The proposed change would promote a clearer organization of activities. Specifically, it would allow Task 9 to focus on the Verification activity (i.e., analysis), while allowing the new task to focus on the Validation activity (i.e., test).

- **ETS Support -** We propose incorporating this activity into Task 5 during the early analysis phase of the EOSDIS Test System (ETS), and then transitioning the activity to Task 4 during later contract years for maintenance and enhancement. The rationale for this recommendation is that we are required to perform acceptance testing on the ETS. Therefore, early program visibility and continual monitoring of the tool development process will ensure our high quality performance.

- **V0 User Interface Assessment -** This activity has been added to Task 9 at the NASA customer's request. The intention of the new activity is to catch any user interface problems as early as possible, and to ensure high user satisfaction.

1.3 Overview of Schedule Status

Exhibit 1-2 presents the latest (i.e., dated 8/9/94), high level milestone chart for all technical tasks assigned on the EOSDIS IV&V contract. In conjunction with this exhibit, Exhibit 1-3 lists in chronological order all deliverables/milestones associated with the contract and the status of each.

1.4 Performance Assurance Activities/Issues

- A peer review process for RID generation has been implemented to ensure the quality and consistency of this activity.

- Incremental training in Object Oriented Design (OOD) is currently being planned. The intent of this training is to allow the engineers on the IV&V team to have firsthand insight into the methodology being used by the system prime (HAIS). Initial training will be in the form of a one-day seminar given by the Software Productivity Consortium on 8/30/94. (Since Intermetrics is a member of the Consortium, the training will be provided at no charge.) Additional training, including the development of a tailored program which specifically examines OOD with respect to IV&V tasks, is also being considered.

- Formal training on the Requirements Traceability Management (RTM) tool is currently being planned for personnel on the analysis tasks (i.e., Tasks 5 and 9).

- IV&V document review/control procedures as well as the set up of the IV&V library are currently underway.

Exhibit 1-2: Gitelman Milestone Chart (Landscape Paste-up)

Date Due	Milestone/ Deliverable	Task #	Status*	Comments
7/8/94	ECS Release A SDR IV&V RIDs	5	C	
7/8/94	SDR IRD RID Package	9	C	
7/15/94	M1 Requirements and Architecture	4	C	
8/16/94	IV&V Management Plan - Draft	3	C	
8/16/94	M1 Initial Tool Architecture Review	4	C	
8/30/94	M2 Requirements - Draft	4	IP	
9/30/94	M2 Requirements - Update	4	O	
10/17/94	ISVVP - Initial	3	IP	
10/17/94	M1 Demonstration	4	O	
10/17/94	M2 Architecture - Draft	4	O	
10/17/94	Preliminary ECS Rqts Analysis Report	5	O	
10/17/94	Version 0 User Assessment	9	O	
10/17/94	Certification Criteria Determination Report - Initial	10	O	
10/31/94	M2 Architecture - Update	4	O	
11/16/94	M2 Development Plan - Draft	4	O	
12/1/94	ECS-TRMM IRD Pilot TAR	9	O	
12/7/94	ETS CDR RIDs	5	O	
12/16/94	IV&V Management Plan - Final	3	O	
12/16/94	ISVVP - Update 1 (includes criticality analysis)	3	O	
12/16/94	M1 Revision 2 (M1R2) Demonstration	4	O	
12/16/94	M2 Element Requirements	4	O	
12/16/94	ECS Release A PDR IV&V RIDs	5	O	
12/16/94	Performance Dependency Analysis Tool Requirements	10	O	
12/16/94	IV&V Contractor EOSDIS ICP - Initial	10	O	
12/30/94	M2 Development Plan - Final	4	O	
12/30/94	Initial ARDB	5	O	
1/16/95	M2 Element Software Design - Draft	4	O	
1/16/95	ESC Release A PDR RIDs	9	O	
2/16/95	M2 System Design Review	4	O	
3/1/95	Initial ARDB for IRD Requirements	9	O	
3/16/95	ECS Interim Rel 1 Rqts Analysis Report	5	O	
3/16/95	M2 Element Software Design - Final	4	O	
3/16/95	M2 Element User's Guide - Draft	4	O	
3/16/95	IV&V Contractor EOSDIS ICP - Interim	10	O	

* C = Completed, IP = In Process, O = Open, D = Delayed, CX = Canceled

EXHIBIT 1-3: Status of Milestones/Deliverables

Date Due	Milestone/ Deliverable	Task #	Status*	Comments
6/15/95	M1 Revision 3 (M1R3) Demonstration	4	O	
6/15/95	Certification Criteria Determination Report - Update	10	O	
6/15/95	IV&V Contractor EOSDIS ICP - Final	10	O	
6/19/95	ECS Release A CDR IV&V RIDs	5	O	
9/30/95	Draft Release IR-1 Test Plans, and Test Procedures	11	O	
10/16/95	M2 Element Software Code	4	O	
10/16/95	M2 User's Guide - Final	4	O	
12/15/95	M2 Element Testing	4	O	
12/30/95	Final Release IR-1 Test Plans, and Test Procedures	11	O	
5/16/96	M2 System Testing	4	O	
6/17/96	M2 System Demonstration	4	O	
As Completed	Release IR-1 Test Reports	11	O	

* C = Completed, IP = In Process, O = Open, D = Delayed, CX = Canceled

EXHIBIT 1-3: Status of Milestones/Deliverables (Continued)

1.5 Major Short Term Activities Planned

- **Office Operations**

  - Move the Greenbelt office to permanent quarters on second floor.

- **Communications**

  - Establish WAN communications between the IV&V team offices in Greenbelt and Fairmont.

  - Establish interfaces and data access privileges between the IV&V team and Goddard, Hughes, TRW, CSC, and the Software IV&V Facility in West Virginia.

  - Develop a library of all IV&V document deliverables and provide on-line access to interested parties.

- **Technical Performance**

  - Finalize inputs for revising task SOWs to more accurately reflect the needs of the program. Also include supplementary work options should additional funding become available.

  - Under Task 3, deliver draft version of IVVMP on 8/15/94.

  - Under Task 4, provide the M1 initial tool architecture review by 8/16/94, and deliver the draft M2 requirements of the IV&V infrastructure and tools by 8/30/94.

  - Under Task 5, populate the requirements metrics and rationale databases, and monitor the ETS development.

  - Under Task 9, develop detailed tool scenarios and requirements for interface analysis.

  - Under Task 10, coordinate testing approach with HAIS.

1.6 Key Long Range Plans/Schedules

The IV&V team will support the activities and milestones identified in Exhibit 1-2. Emphasis will be placed on those activities that are on the critical path to support the on-time launch of the spacecraft. Such activities include Key Interface and Integration Testing (KIIT) and System Certification.

2. FINANCIAL/CONTRACTUAL INFORMATION

Section 2 of This Report

Has Been Removed

Due to Proprietary Content.

3. TECHNICAL INFORMATION

3.1 Task # 3: Independent Verification and Validation Plans

a) Task Accomplishments

- Initiated development of the IV&V Master Plan (IVVMP).
- Supported technical interchange meetings.

b) Issues/Concerns

- None.

c) Subcontractor Performance

- Consultations as required, no in-line role.

d) Planned Activities

- Deliver draft version of IVVMP on 8/15/94.
- Prepare and deliver IVVMP overview briefing at the 8/15 status meeting.
- Begin developing the Independent System V&V Plan (ISVVP).
- Support program briefings as required.

3.2 Task # 4: IV&V Infrastructure and Tool Development

a) Task Accomplishments

- Produced and delivered to NASA the requirements and architecture specifications for the Milestone 1 (M1) configuration of the IV&V infrastructure and tools.
- Initiated the procurement of hardware and software for M1.
- Presented Task 4 results and plans to WVU and GSIWG.
- Evaluated Lotus Notes software.

b) Issues/Concerns

- None.

c) Subcontractor Performance

- CTA performed well by providing inputs/comments on the definition of tool requirements.

- EWA was responsive in identifying quality candidate personnel for this task.

d) Planned Activities

- Present the M1 selected tools and architecture for customer review on 8/15/94.

- Complete and deliver the draft Milestone 2 requirements. This draft will contain a conceptual description of M2, the M2 requirements, and operational scenarios.

- Establish WAN communication between Greenbelt and Fairmont.

- Install M1 hardware and software.

- Develop user interface for requirements analysis task (Task 5).

- Complete initial staffing for Task 4.

- Provide orientation for new employees.

- Support program briefings as required.

3.3 Task # 5: Requirements Analysis and Traceability

a) Task Accomplishments

- Structured individual personnel assignments and responsibilities around the different EOSDIS requirements analysis functional areas.

- Developed evaluation criteria for requirements analysis technical integrity (See Appendix 5A). This includes a requirements database which is actually a linked-composite of three databases operating on the Greenbelt office PC LAN: requirements traceability (using RTM on a Sun workstation), a metrics Excel database (to quantify problem severity by requirement), and an embedded engineering rationale MS Word database. Task 9 personnel will also use this database to perform/quantify IRD problem analyses. Both Task 5 and Task 9

personnel have begun populating the requirements metrics and engineering rationale databases.

- Met with Bob Curran (HAIS ECS Project Scientist) to discuss user satisfaction issues.

- Monitored ETS development.

b) Issues/Concerns

- The potential lack of availability of new EDOS level 3 requirements due to ongoing requirements scrub. Once requirements stabilize, we will make it a priority to obtain the level 3 documentation.

- The potential difficulty of accessing Ecom level 3 requirements. While this is not an immediate concern, it can become one in the future. To address the issue, we have talked informally to the Ecom program office and explicitly to Booz Allen. Our plan is to formally identify what we need by early September and then request the data from the Ecom Program Manager.

- Insufficient Task 5 staffing level (due to funding limitations) to effectively work ETS and science user model validation. As a result, we will monitor ETS development, but not perform a full requirements analysis or develop acceptance test requirements. In addition, the science user model validation will have to be placed on hold for the time being.

c) Subcontractor Performance

- Subcontractor performance from CTA and SMSRC has been excellent.

d) Planned Activities

- Continue populating the requirements metrics and rationale databases.

- Obtain electronic copies of all (baselined) requirements documents by mid August.

- Arrange for RTM user training and system administrator training from Marconi.

- Finalize requirements traceability database (RTM) schema.

- Meet with Mike King (EOS Project Scientist) to discuss science user satisfaction issues (targeted for 8/18/94).

- Finalize EOSDIS user satisfaction assessment IV&V approach.

- Continue monitoring ETS development.

- Support program briefings as required.

3.4 Task # 9: Key Interface Analysis and Test

a) Task Accomplishments

- Staffing and Task Startup
  - Conducted extensive recruiting activities. Initial staffing is 2.6. Kate Murphy, who was a senior staff member on ST TAV, will be the deputy task lead.

  - Developed a task plan and began staff familiarization with applicable documentation.

- SDR Support
  - Attended the ECS System Design Review.

  - Obtained and reviewed nine HAIS Interface Requirements Documents (IRDs).

- TRMM
  - All TRMM activities are being used as a test case for refining our approach to interface analysis, as well as for determining specific issues associated with TRMM itself.

  - Began detailed analysis of the TRMM IRD. This included supporting the trial of the requirements analysis approach, as applied in Task 5, to the IRD requirements. Also, began analyzing interface standards referenced in IRD requirements, and developed an approach to data flow analysis that will be applied to future IRDs, using TRMM as a test case.

  - Developed detailed outline of the TRMM Technical Assessment Report (TAR) and began drafting the TAR.

- Deliverables
  - Completed and delivered the IRD RID Package.

b) Issues/Concerns

- Would like to receive working copies of the Architecture Definition Document and the Ground System Architecture Diagram. These documents provide the project representation of what the EOSDIS system looks like and are essential for any work

involving key interfaces. Requests have been made to the SES representative for these documents.

c) Subcontractor Performance

- CTA is the task lead for this effort. Their performance has been excellent.

d) Planned Activities

- Staffing
  - Continue recruiting activities. Approximately three additional staff will be added in the short term. Will coordinate with Task 5 on task phase up.

- TRMM
  - Continue the detailed analysis of the TRMM IRD. This includes completing the requirements analysis approach, as applied in Task 5, to the TRMM IRD requirements; continuing the analysis of interface standards referenced in IRD requirements; and applying the approach for data flow analysis to TRMM. Also develop TRMM specific findings, and refine approach for subsequent analyses.

  - Complete initial draft of the TAR.

- Miscellaneous
  - Develop detailed tool scenarios and requirements for interface analysis.
  - Support program briefings as required.

3.5 Task # 10: Development of EOSDIS Certification Plan

a) Task Accomplishments

- Initiated development of the EOSDIS Certification Plan (ECP).
- Briefed certification approach at the June 29 GSIWG.
- Supported technical interchange meetings:
  - Weekly GSIWG
  - On request with CSC/SES
- Provided comments on draft version of EOSDIS Integration and Certification Plan (EICP).
- Drafted an outline for the ECP.

b) Issues/Concerns

- Roles and responsibilities associated with the EOSDIS certification program are still evolving and require specific definition. To help clarify the situation, we have participated in the Ground System Integration Working Group (GSIWG) and proposed an initial assignment of responsibility.
- No rigorous taxonomy exists for levels of tests. In an attempt to formalize the process, we have constructed a candidate hierarchy of test levels and characterized what is done at each level.

c) Subcontractor Performance

- CTA has performed in line and participated in all task activities, including inputs to the Interface Master Test Plan.

d) Planned Activities

- Begin developing the Certification Criteria Determination Position paper.
- Continue work on providing rigorous and logically consistent definitions for EOSDIS testing.
- Initiate coordination of testing approach with HAIS.
- Support program briefings as required.

TASK
APPENDICES

APPENDIX 5A: REQUIREMENTS ANALYSIS - TECHNICAL INTEGRITY EVALUATION CRITERIA

Each requirement at levels 2, 3, and 4 will be evaluated in terms of three technical integrity categories: 1) traceability, 2) quality, and 3) testability. Categories will be evaluated independently of each other (i.e., it is possible that a requirement will be evaluate badly in one category and well in another). The result of each evaluation will be quantified using a rating scale of 0 (no problems) to 3 (major problems) according the specific definitions associated with each category. A rating of 4 is a "flag" which indicates an unknown state: not yet analyzed or TBD pending further information. The technical integrity evaluation process is illustrated in Exhibit A.

Each evaluation will include a brief engineering rationale which substantiates the assigned rating. Whenever an evaluation indicates multiple problems at differing levels of severity, the assigned rating will reflect the most severe case. The engineering rationale will sufficiently characterize all (most severe and other) identified problems so that corrective measures can be effectively applied to the collection.

Each requirement metrics data base entry will include current IV&V evaluation status information. Status will be expressed by a numeric code indicating what work (if any) is in-progress and the date on which the current status became effective:

Status	Meaning	As of Date
2	Analysis in-progress	mm/dd/yy
1	Review in-progress	mm/dd/yy
0	Evaluation complete	mm/dd/yy

The technical integrity requirements evaluation process will include an analysis activity followed by review(es) before the results are formally reported to non-IV&V personnel. Requirements which evaluate, in every category, as 0 or 1 only require peer review. Requirements which evaluate, in any category, as 2 or 3 require peer review followed by IV&V management review.

The description of each category and associated evaluation criteria are described on the following pages.